AN ACCOUNT OF SOME CHEMICAL EXPERIMENTS ON TABASHEER. BY JAMES LOUIS...

James Louis Macie

AN

ACCOUNT, &c.

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THE Tabaſheer employed in theſe experiments was that which Dr. RUSSELL laid before the Society, as ſpecimens of this ſubſtance, the evening his Paper upon the ſubject was read *.

There were ſeven parcels.

N° 1. conſiſted of Tabaſheer extracted from the bamboo by Dr. RUSSELL himſelf.

N° 2. had been partly taken from the reed in Dr. RUSSELL's preſence, and partly brought to him at different times by a perſon who worked in bamboos.

N° 3. was the Tabaſheer from Hydrabad, the fineſt kind of this ſubſtance to be bought.

N° 4, 5, and 6 all came from Maſulapatam, where they are ſold at a very low price. Theſe three kinds have been thought to be artificial compoſitions in imitation of the true Tabaſheer, and to be made of calcined bones.

N° 7. had no account affixed to it.

The Tabaſheer from Hydrabad being in the greateſt quantity, and appearing the moſt homogeneous and pure, the experiments were begun, and principally made, with it.

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* See Phil. Tranſ. Vol. LXXX. p. 283.

Hydrabad

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Hydrabad Tabaſheer. (N° 3)

§ I. (A) This, in its general appearance, very much reſembled fragments of that variety of calcedony which is known to mineralogiſts by the name of *Cacholong*. Some pieces were quite opaque, and abſolutely white; but others poſſeſſed a ſmall degree of tranſparency, and had a bluiſh caſt. The latter, held before a lighted candle, appeared very pellucid, and of a flame colour.

The pieces were of various ſizes; the largeſt of them did not exceed two or three tenths of an inch cube. Their ſhape was quite irregular, ſome of them bore impreſſions of the inner part of the bamboo againſt which they were formed.

(B) This Tabaſheer could not be broken by preſſure between the fingers, but by the teeth it was eaſily reduced to powder. On firſt chewing it felt gritty, but ſoon ground to impalpable particles.

(C) Applied to the tongue, it adhered to it by capillary attraction.

(D) It had a diſagreeable earthy taſte, ſomething like that of magneſia.

(E) No light was produced either by cutting it with a knife, or by rubbing two pieces of it together, in the dark; but a bit of this ſubſtance, being laid on a hot iron, ſoon appeared ſurrounded with a feeble luminous *aureole*. By being made red hot, it was deprived of this property of ſhining when gently heated; but recovered it again, on being kept for two months.

(F) Examined with the microſcope, it did not appear different from what it does to the naked eye.

(G) A quantity of this Tabaſheer which weighed 75.7 gr. in air, weighed only 41.1 gr. in diſtilled water whoſe temperature was 52.5 F. which makes its ſpecific gravity to be very nearly = 2.188.

Mr. Cavendish, having tried this ſame parcel when become again quite dry, found its ſpecific gravity to be = 2.169.

Treated with water.

§ II. (A) This Tabaſheer, put into water, emitted a number of bubbles of air; the white opaque bits became tranſparent in a ſmall degree only, but the bluiſh ones nearly as much ſo as glaſs. In this ſtate the different colour produced by reflected and by tranſmitted light was very ſenſible.

(B) Four bits of this ſubſtance, weighing together, while dry and opaque, 4.1 gr., were put into diſtilled water, and let become tranſparent, being then taken out, and the unabſorbed water haſtily wiped from their ſurface, they were again weighed, and were found to equal 8.2 gr.

In the experiment § I (G), 75.7 gr. of this ſubſtance abſorbed 69.5 gr. of diſtilled water.

(C) Four bits of Tabaſheer, weighing together 3.2 gr. were boiled for 30′ in half an ounce of diſtilled water in a Florence flaſk, which had been previouſly rinſed with ſome of the ſame fluid. This water, when become cold, did not ſhew any change on the admixture of vitriolic acid, of acid of ſugar, nor of ſolutions of nitre of ſilver, or of cryſtals of ſoda; yet, on its evaporation, it left a white film on the glaſs, which could not be got off by waſhing in cold water, nor by hot

marine

muriatic acid, but which was diſcharged by warm cauſtic vegetable alkali, and by long ebullition in water.

Upon theſe bits of Tabaſheer, another half ounce of diſtilled water was poured, and again boiled for about half an hour. This water alſo on evaporation left a white film on the glaſs veſſel, ſimilar to the above. The pieces of Tabaſheer having been dried, by expoſure to the air for ſome days in a warm room, were found to have loſt one-tenth of a grain of their weight.

To aſcertain whether the whole of a piece of Tabaſheer could be diſſolved by boiling in water, a little bit of this ſubſtance, weighing three-tenths of a grain, was boiled in 36 ounces of ſoft water for near five hours conſecutively; but being afterwards dried and weighed, it was not diminiſhed in quantity, nor was it deprived of its taſte.

With vegetable colours.

§ III Some Tabaſheer, reduced to fine powder, was boiled for a conſiderable time in infuſions of turnſole, of logwood, and of dried red cabbage, but produced not the leaſt change in any one of them.

At the fire.

§ IV. (A) A piece of this Tabaſheer, thrown into a red hot crucible, did not burn or grow black. Kept red hot for ſome time, it underwent no viſible change, but when cold, it was harder, and had entirely loſt its taſte. Put into water it

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grew tranſparent, juſt as it would have done, had it not been ignited.

(B) 6,4 gr. of this ſubſtance, made red hot in a crucible, were found, upon being weighed as ſoon as cold, to have loſt two tenths of a grain. This loſs appears to have ariſen merely from the expulſion of interpoſed moiſture; for theſe heated pieces, on being expoſed to the air for ſome days, recovered exactly their former weight.

(C) A bit of this ſubſtance was put into an earthen crucible, ſurrounded with ſand, and kept red hot for ſome time; when cold, it was ſtill white, both exteriorly and interiorly.

(D) Thrown into ſome melted red hot nitre, this ſubſtance did not produce any deflagration, or ſeem to ſuffer any alteration.

(E) A bit expoſed on charcoal to the flame of the blow-pipe did not decrepitate or change colour; when firſt heated it diffuſed a pleaſant ſmell, then contracted very conſiderably in bulk, and became tranſparent; but on continuing the heat it again grew white and opaque, but ſeemed not to ſhew any inclination to melt *per ſe*. Poſſibly, however, it may ſuffer ſuch a ſemi-fuſion, or ſoftening of the whole maſs, as takes place in clay when expoſed to an intenſe heat; for when the bit uſed happened to have cracks, it ſeparated during its contraction, at theſe cracks, and the parts receded from each other without falling aſunder.

If, while the bit of Tabaſheer was expoſed to the flame, any of the aſhes of the coal fell upon it, it inſtantly melted, and ſmall very fluid bubbles were produced. That the opacity which this ſubſtance acquires on continuing to heat it after it is become tranſparent, is not owing to the fuſion of its

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ſurface by means of ſome of the aſhes of the charcoal ſettling upon it unobſerved, appeared by its undergoing the ſame change when fixed to the end of a glaſs tube, in the method of M. DE SAUSSURE *.

With acids.

§ V. (A) A piece of Tabaſheer, weighing 12 gr. was firſt let ſaturate itſelf with diſtilled water; its ſurface being then wiped dry, it was put into a matraſs with ſome pure white marine acid, whoſe ſpecific gravity was 1.13. No effervеſcence aroſe on its immerſion into the acid, nor did this menſtruum, even by ebullition, ſeem to have any action upon it, or itſelf receive any colour. The acid being evaporated left only ſome dark-coloured ſpots on the glaſs. Theſe ſpots were diſſolved by diſtilled water. No precipitation was produced in this water by vitriolic acid, or by a ſolution of cryſtals of ſoda. The bit of Tabaſheer waſhed with water, and made red hot, had not ſuſtained any loſs of weight.

The pores of the maſs of Tabaſheer were filled with water before it was put into the acid, to expel the common air contained in them, and which would have made it impoſſible to aſcertain with accuracy whether any effervеſcence was produced on its firſt contact with the menſtruum.

(B) Another portion of Tabaſheer, weighing 10.2 gr. was boiled in ſome of the ſame marine acid. Not the leaſt precipitate was produced on ſaturating this acid with ſolution of mild ſoda. This Tabaſheer alſo, after having been

boiled

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* Journal de Phyſique, Tom. XXVI. p. 409.

boiled in water, and dried by expoſure for ſome days to the air, was ſtill of its former weight.

§ VI. This ſubſtance ſeemed in like manner to reſiſt the action of pure white nitrous acid boiled upon it.

§ VII. (A) A bit of Tabaſheer weighing 0.6 gr. was digeſted in ſome ſtrong white vitriolic acid, which had been made perfectly pure by diſtillation. It did not ſeem by this treatment to ſuffer any change, and after having been freed from all adhering vitriolic acid by boiling in water, it had not undergone any alteration either in its weight or properties. The vitriolic acid afforded no precipitate on being ſaturated with ſoda.

(B) Two grains of Tabaſheer reduced to fine powder were made into a paſte with ſome of this ſame vitriolic acid, and this mixture was heated till nearly dry; it was then digeſted in diſtilled water. This water, being filtered, taſted ſlightly acid, did not produce the leaſt turbidneſs with ſolution of ſoda, and ſome of it, evaporated, left only a faint black ſtain on the glaſs, produced doubtleſs by the action of the vitriolic acid on a little vegetable matter, which it had received either from the Tabaſheer, or from the paper. The undiſſolved matter collected, waſhed, and dried, weighed 1.9 gr.

§ VIII. 2 gr. of Tabaſheer, reduced to fine powder, were long digeſted in a conſiderable quantity of liquid acid of ſugar. The taſte of the liquor was not altered; and being ſaturated with a ſolution of cryſtals of ſoda in diſtilled water, it did not afford any precipitate. The Tabaſheer having been freed from all adhering acid, by very careful ablution with diſtilled water, and let dry in the air, was totally unchanged in its appearance, and weighed 1.98 gr. This Tabaſheer being gradually heated till red hot, did not become in the leaſt black, or loſe much of its weight, a proof that no acid of ſugar had fixed in it.

With liquid alkalies.

§ IX. (A) Some liquid cauſtic vegetable alkali being heated in a phial, Tabaſheer was added to it, which diſſolved very readily, and in conſiderable quantity. When the alkali would not take up any more, it was ſet by to cool, but was not found next morning to have cryſtallized, or undergone any change, though it had become very concentrated, during the boiling, by the evaporation of much of the water.

(B) This ſolution had an alkaline taſte, but ſeemingly with little, if any, cauſticity.

(C) A drop of it changed to green a watery tincture of dried red cabbage.

(D) Some of this ſolution was expoſed in a ſhallow glaſs to ſpontaneous evaporation in a warm room. At the end of a day or two it was converted into a firm, milky jelly. After a few days more, this jelly was become whiter, more opaque, and had dried and cracked into ſeveral pieces, and finally it became quite dry, and curled up and ſeparated from the glaſs.

The ſame change took place when the ſolution had been diluted with ſeveral times its bulk of diſtilled water, only the jelly was much thinner, and dried into a white powder.

Some of this ſolution, kept for many weeks in a bottle cloſely ſtopped, did not become a jelly, or undergo any change.

(E) A ſmall quantity of this ſolution was let fall into a proportionably large quantity of ſpirit of wine, whoſe ſpecific gravity was 838. The mixture immediately became turbid, and, on ſtanding, a denſe fluid ſettled to the bottom, and which, when the bottle was haſtily inverted, fell through the ſpirit of wine in round drops, like a ponderous oil.

The ſupernatant ſpirit of wine being carefully decanted off, ſome diſtilled water was added to this thick fluid, by which it was wholly diſſolved. This ſolution, expoſed to the air, ſhewed phænomena exactly ſimilar to thoſe of the undiluted ſolution (D).

The decanted ſpirit being alſo left expoſed to the air in a ſhallow glaſs veſſel, did not, after many days, either depoſit a ſenſible quantity of precipitate, or become gelatinous; but having evaporated nearly away, left a few drops of a liquor which made infuſion of red cabbage green; and, on the addition of ſome pure marine acid, efferveſced violently. No precipitate fell during this ſaturation with the acid, nor did the mixture on ſtanding become a jelly; and on the total evaporation of the fluid part, a ſmall quantity of muriate of tartar only remained. The ſpirit of wine ſeems, therefore, to have diſſolved merely a portion of ſuperabundant alkali preſent in the mixture, but none of that united with Tabaſheer.

(F) To different portions of this ſolution were added ſome pure marine acid, ſome pure white vitriolic acid, and ſome diſtilled vinegar, each in exceſs. Theſe acids at firſt produced neither heat, effervescence, any precipitate, or the leaſt ſenſible effect, except the vitriolic acid, which threw down a very ſmall quantity of a white matter; but, after ſtanding ſome days, theſe mixtures changed into jellies ſo firm, that the

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the glaſſes containing them were inverted without their falling out.

This change into jelly equally took place whether the mixtures were kept in open or cloſed veſſels, were expoſed to the light, or ſecluded from it; nor did it ſeem to be much promoted by boiling the mixtures.

(G) Some ſolution of mild volatile alkali in diſtilled water, being added to ſome of this ſolution, ſeemed at the firſt inſtant of mixture to have no effect upon it; but in the ſpace of a ſecond or two it occaſioned a copious white precipitate.

(H) The flakes remaining on the glaſſes at (D) and (E) put into marine acid raiſed a ſlight effervescence, but did not diſſolve. Theſe flakes, when taken out of the acid, and well waſhed, were found, like the original Tabaſheer, to be white and opaque when dry; but to become tranſparent when moiſtened, and then to ſhew the blue and flame colour, § II (A).

(I) The jellies (F), diluted with water, and collected on a filter, appeared to be the Tabaſheer unchanged.

§ X. A bit of Tabaſheer, weighing two tenths of a grain, was boiled in 127 gr. of ſtrong cauſtic volatile alkali for a conſiderable time; but after being made red hot, it had not ſuſtained the leaſt diminution of weight.

§ XI. (A) 27 gr. of Tabaſheer, reduced to fine powder, were put into an open tin veſſel with 100 gr. of cryſtals of ſoda, and ſome diſtilled water, and this mixture was made boil for three hours. The clear liquor was then poured off, and the Tabaſheer was digeſted in ſome pure marine acid; after ſome time this acid was decanted, and the Tabaſheer waſhed with diſtilled water, which was then added to the acid.

(B) This Tabaſheer was put back into the alkaline ſolution, which ſeemed not impaired by the foregoing proceſs, and again boiled for a conſiderable time. The liquor was then poured from it while hot, and the Tabaſheer edulcorated with ſome cold diſtilled water, which was afterwards mixed with this hot ſolution, in which it inſtantly cauſed a precipitation. On heating the mixture it became clear again; but as it cooled it changed wholly into a thin jelly; but, in the courſe of a few days, it ſeparated into two portions, the jelly ſettling in a denſer ſtate to the bottom of the veſſel, leaving a limpid liquor over it.

(C) The Tabaſheer remaining (B) was boiled in pure marine acid, the acid was then poured off, and the Tabaſheer edulcorated with ſome diſtilled water, which was afterwards mixed with the acid.

(D) The remaining Tabaſheer collected, waſhed, and dried, weighed 24 gr. and ſeemed not to be altered.

(E) The acid liquors (A and C) were mixed together, and ſaturated with ſoda, but afforded no precipitate.

(F) The alkaline mixture (B) was poured upon a filter, the clear liquor came through, leaving the jelly on the paper.

Some of this clear liquor, expoſed to the air in a ſaucer, at the end of ſome days depoſited a ſmall quantity of a gelatinous matter; after ſome days more, the whole fluid part exhaled, and the ſaucer became covered with regular cryſtals of ſoda, which afforded no precipitate during their ſolution in vitriolic acid. What had appeared like a jelly while moiſt aſſumed, on drying, the form of a white powder. This powder was inſoluble in vitriolic acid, and ſeemed ſtill to be Tabaſheer.

Some

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Some of this clear liquor, mixed with marine acid, effervesced; did not afford any precipitate, but, on ſtanding ſome days, the mixture became ſlightly gelatinous.

(G) Some of the thick jelly remaining on the filter, being boiled in water and in marine acid, appeared inſoluble in both, and ſeemed to agree entirely with the above powder (F).

With dry alkalies.

§ XII. (A) Tabaſheer melted on the charcoal at the blow-pipe with ſoda, with conſiderable effervescence. When the proportion of alkali was large, the Tabaſheer quickly diſſolved, and the whole ſpread on the coal, ſoaked into it, and vaniſhed; but, by adding the alkali to the bit of Tabaſheer in exceedingly ſmall quantities at a time, this ſubſtance was converted into a pearl of clear colourleſs glaſs.

(B) 5 gr. of Tabaſheer, reduced to fine powder, were melted in a platina crucible with 100 gr. of cryſtals of ſoda. The maſs obtained was white and opaque, and weighed 40.2 gr. Put into an ounce of diſtilled water, it wholly diſſolved. An exceſs of marine acid let fall into this ſolution produced an effervescence, and changed it into a jelly. This mixture was ſtirred about, and then thrown upon a filter. The jelly left on the paper did not diſſolve in marine acid by ebullition; collected, waſhed with diſtilled water, and dried, it weighed 4.5 gr. and ſeemed to be the Tabaſheer unaltered.

The liquor which had come through being ſaturated with mineral alkali yielded only a very ſmall quantity of a red precipitate, which was the colouring matter of the pink blotting paper through which it had been paſſed.

(C) 10 gr. of Tabaſheer, reduced to powder, were mixed with an equal weight of ſoda, deprived of its water of cryſtallization by heat. This mixture was put into a platina crucible, and expoſed to a ſtrong fire for 15′. It was then found converted into a tranſparent glaſs of a ſlight yellow colour. This glaſs was broken into pieces, and boiled in marine acid. No efferveſcence appeared; but the glaſs was diſſolved into a jelly. This jelly, collected on a filter, well waſhed, and dried, weighed 7.7 gr.

The acid liquor which came through, on ſaturation with ſoda, afforded not the leaſt precipitate; but, after ſtanding a day or two, it changed into a thin jelly. This collected on a filter was waſhed with diſtilled water, and then boiled in marine acid, but did not diſſolve. Being again edulcorated, and made red hot, it weighed 1.6 gr. The filtered liquor (B) would in all probability have changed ſimilarly to a jelly, had it been kept. Theſe precipitates were analogous to thoſe § IX. (I).

(D) An equal weight of vegetable alkali and Tabaſheer were melted together in the platina crucible. The glaſs produced was tranſparent, but it had a fiery taſte, and ſoon attracted the moiſture of the air, and diſſolved into a thick liquor. But two parts of vegetable alkali, with three of Tabaſheer, yielded a tranſparent glaſs, which was permanent.

Treated with other fluxes.

§ XIII. (A) A fragment of Tabaſheer put into glaſs of borax, and urged at the blow-pipe, contracted very conſiderably in ſize, the ſame as when heated *per ſe*; after which it continued turning about in the flux, diſſolving with great difficulty and very ſlowly. When the ſolution was effected, the ſaline pearl remained perfectly clear and colourleſs.

(B) With phoſphoric ammoniac (made by ſaturating the acid obtained by the ſlow combuſtion of phoſphorus with cauſtic volatile alkali) the Tabaſheer very readily melted on the charcoal at the blow-pipe, with effervеſcence, into a white frothy bead.

(C) Fuſed, by the ſame means, on a plate of platina, with the vitriols of tartar and ſoda, it appeared entirely to reſiſt their action; the little particles employed continuing to revolve in the fluid globules without ſuſtaining any ſenſible diminution of ſize: and the ſaline beads on cooling aſſumed their uſual opacity.

(D) A bit of Tabaſheer was laid on a plate of ſilver, and a little litharge was put over it, and then melted with the blow-pipe. It immediately acted on the Tabaſheer, and covered it with a white glaſſy glazing. By the addition of more litharge the maſs was brought to a round bead, though with conſiderable difficulty. This bead bore melting on the charcoal, without any reduction of the lead, but could not be obtained tranſparent.

(E) The caſe with which this ſubſtance had melted with vegetable aſhes, led to the trial of it with pure calcareous earth. A fragment of Tabaſheer, fixed to the end of a bit of glaſs, was rubbed over with ſome powdered whiting. As ſoon as expoſed to the flame of the blow pipe, it melted with conſiderable effervеſcence; but could not, even on the charcoal, and with the addition of more whiting, be brought to a tranſparent ſtate, or reduced into a round bead.

Equal weights of Tabaſheer and pure calcareous ſpar, both reduced to fine powder, were irregularly mixed, and expoſed in the platina crucible to a ſtrong fire in a forge for 20′; but did not even concrete together.

(F) When magneſia was uſed, no fuſion took place at the blow-pipe.

(G) Equal parts of Tabaſheer, whiting, and earth of alum precipitated by mild volatile alkali, were mixed in a ſtate of powder, and ſubmitted in the platina crucible to a ſtrong fire for 20′, but were afterwards found unmelted.

Examination of the other ſpecimens.

N° I.

This parcel contained particles of three kinds; ſome white, of a ſmooth texture, much reſembling the foregoing ſort, others of the ſame appearance, but yellowiſh, and others greatly ſimilar to bits of dried mould.

The white and yellowiſh pieces were ſo ſoft as to be very eaſily rubbed to powder between the fingers. They had a diſagreeable taſte, ſomething like that of rhubarb. Put into water, the white bits ſcarcely grew at all tranſparent, but the yellow ones became ſo to a conſiderable degree.

The brown earth-like pieces were harder than the above, had little taſte, floated upon water, and remained opaque.

Expoſed to the blow-pipe, they all charred and grew black, the laſt variety even burned with a flame. When the vegetable matter was conſumed, the pieces remained white, and then had exactly the appearance, and poſſeſſed all the properties, of the the foregoing Tabaſheer from Hydrabad, and like it melted with ſoda into a tranſparent glaſs.

N° II.

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N° III.

Alſo conſiſted of bits of three ſorts.

(*a*) Some white, nearly opaque.

(*b*) A few ſmall very tranſparent particles, ſhewing, in an eminent degree, the blue and yellow colour, by the different direction of light.

(*c*) Coarſe, browniſh pieces of a grained texture.

Theſe all had exactly the ſame taſte, hardneſs, &c. and ſhewed the ſame effects at the blow-pipe, as N° I.

27 gr. of this Tabaſheer thrown into a red-hot crucible, burned with a yellowiſh white flame, loſt 2·9 gr. in weight, and became ſo ſimilar to the Hydrabad kind as not to be diſtinguiſhed from it.

Some of this Tabaſheer put into a crucible, not made very hot, emitted a ſmell ſomething like tobacco aſhes, but not the kind of perfume diſcovered in that from Hydrabad, § IV. (E)

N° IV.

All the pieces of this parcel were of one appearance, and a good deal reſembled, in their texture, the third variety of N° II. Their colour was white; their hardneſs ſuch as very difficultly to be broken by preſſure between the fingers. In the mouth they immediately fell to a pulpy powder, and had no taſte.

A bit expoſed on the charcoal to the blow-pipe became black, melted like ſome vegetable matters, caught flame, and burnt to a brown inflated coal, which ſoon entirely conſumed away, and vaniſhed.

A piece put into water fell to a powder. The mixture being boiled, this powder diſſolved, and turned the whole to a jelly.

Theſe properties are exactly thoſe of common ſtarch.

N° V.

Agreed entirely with N° IV. in appearance, properties, and nature.

N° VI.

The pieces of this parcel were white, quite opaque, and conſiderably hard. Their taſte and effects at the blow-pipe, were perfectly ſimilar to thoſe of the Hydrabad kind.

N° VII.

Much reſembled N° VI. only was rather ſofter, and ſeemed to blacken a little when firſt heated. With fluxes at the blow-pipe it ſhewed the ſame effects as all the above.

Concluſion.

1. It appears from theſe experiments, that all the parcels, except N° IV. and V. conſiſted of genuine Tabaſheer; but that thoſe kinds, immediately taken from the plant, contained a certain portion of a vegetable matter, which was wanting in the ſpecimens procured from the ſhops, and which had probably been deprived of this admixture by calcination, of which operation a partial blackneſs, obſervable on ſome of the pieces of N° III. and VI. are doubtleſs the traces. This accounts alſo for the ſuperior hardneſs and diminiſhed taſtes of theſe ſorts.

2. The nature of this ſubſtance is very different from what might have been expected in the product of a vegetable. Its indeſtructibility by fire; its total reſiſtance to acids; its uniting

by fuſion with alkalies in certain proportions into a white opaque maſs, in others into a tranſparent permanent glaſs; and its being again ſeparable from theſe compounds, entirely unchanged by acids, &c. ſeem to afford the ſtrongeſt reaſons to conſider it as perfectly identical with common *ſiliceous earth*.

Yet from pure quartz it may be thought to differ in ſome material particulars: ſuch as in its fuſing with calcareous earth, in ſome of its effects with liquid alkalies, in its taſte, and its ſpecific gravity.

But its taſte may ariſe merely from its divided ſtate, for chalk and powdery magneſia both have taſtes, and taſtes which are very ſimilar to that of pure Tabaſheer, but when theſe earths are taken in the denſer ſtate of cryſtals, they are found to be quite inſipid: ſo Tabaſheer, when made more ſolid by expoſure to a pretty ſtrong heat, is no longer perceived, when chewed, to act upon the palate, § IV. (A).

And, on accurate compariſon, its effects with liquid alkalies have not appeared peculiar; for though it was found on trial, that the powder of common flints, when boiled in ſome of the ſame liquid cauſtic alkali employed at § IX. (A), was ſcarcely at all acted upon: and that the very little which was diſſolved was ſoon precipitated again, in the form of minute *flocculi*, on expoſing the ſolution to the air, and was immediately thrown down on the admixture of an acid; yet the precipitate obtained from *liquor ſilicum* by marine acid was diſcovered, even when dry to diſſolve readily in this alkali, but while ſtill *moiſt* to do ſo very copiouſly, even without the aſſiſtance of heat, and ſome of this ſolution, thus ſaturated with ſiliceous matter by ebullition, being expoſed to the air in a ſhallow glaſs, became a jelly by the next day, and the day after dried, and cracked, &c. exactly like the mixtures § IX.

(D and E). And another portion of this ſolution mixed with marine acid afforded no precipitate, and remained perfectly unaffected for two days; but on the third it was converted into a firm jelly like that § IX. (F).

As gypſum is found to melt *per ſe* at the blow pipe, though refractory to the ſtrongeſt heat that can be made in a furnace, it was thought that poſſibly ſiliceous and calcareous earths might flux together by this means, though they reſiſt the utmoſt power of common fires; but experiment ſhewed, that in this reſpect quartz did not agree with Tabaſheer. But this difference ſeems much too likely to depend on the admixture of a little foreign matter in the latter body, to admit of its being made the grounds for conſidering it as a new ſubſtance, in oppoſition to ſo many more material points in which it agrees with ſilex.

Nor can much weight be laid on the inferior ſpecific gravity of a body ſo very porous. The infuſibility of the mixture § XIII. (G) depended alſo, probably, either on an inaccuracy in the proportions of the earths to each other, or on a deficiency of heat.

3. Of the three bamboos which were not ſplit before the Royal Society I have opened two. The Tabaſheer found in them agreed entirely in its properties with that of N° I. and II.

It was obſerved, that all the Tabaſheer in the ſame joint was exactly of the ſame appearance. In one joint it was all ſimilar to the yellowiſh ſort N° I. In another joint of the ſame bamboo, it reſembled the variety (c) of N° II. Probably, therefore, the parcels from Dr. Russell, containing each ſeveral varieties of this ſubſtance, aroſe from the produce of many joints having been mixed together.

4. The aſhes, obtained by burning the bamboo, boiled in marine acid, left a very large quantity of a whitiſh inſoluble powder, which, fuſed at the blow-pipe with ſoda, effervesced, and formed a tranſparent glaſs. Only the middle part of the joints was burned, the knots were ſawed off, leſt, being porous, Tabaſheer might be mechanically lodged in them. However, the great quantity of this remaining ſubſtance ſhews it to be an eſſential, conſtituent part of the wood.

The aſhes of common charcoal, digeſted in marine acid, left in the ſame manner an inſoluble reſiduum which fuſed with ſoda with effervescence, and formed glaſs; but the proportion of this matter to the aſhes was greatly leſs than in the foregoing caſe.

5. Since the above experiments were made, a ſingular circumſtance has preſented itſelf. A green bamboo, cut in the hot-houſe of Dr. PITCAIRN, at Iſlington, was judged to contain Tabaſheer in one of its joints, from a rattling noiſe diſcoverable on ſhaking it; but being ſplit by Sir JOSEPH BANKS, it was found to contain, not ordinary Tabaſheer, but a ſolid pebble, about the ſize of half a pea.

Externally this pebble was of an irregular rounded form, of a dark-brown or black colour. Internally it was reddiſh-brown, of a cloſe dull texture, much like ſome martial ſiliceous ſtones. In one corner there were ſhining particles, which appeared to be cryſtals, but too minute to be diſtinguiſhed even with the microſcope.

This ſubſtance was ſo hard as to cut glaſs!

A fragment of it expoſed to the blow-pipe on the charcoal did not grow white, contract in ſize, melt, or undergo any change. Put into borax it did not diſſolve, but loſt its colour, and tinged the flux green. With ſoda it efferveſced, and formed a round bead of opaque black glaſs.

Theſe two beads, digeſted in ſome perfectly pure and white marine acid, only partially diſſolved, and tinged this menſtruum of a greeniſh yellow colour, and from this ſolution Pruſſiate of tartar, ſo pure as not, under many hours, to produce a blue colour with the above pure marine acid, inſtantly threw down a very copious Pruſſian blue.

P. S. In aſcertaining the ſpecific gravity of the Hydrated Tabaſheer, § I (G), great care was taken in both the experiments that every bit was thoroughly penetrated with the water, and tranſparent to its very center, before its weight in the water was determined.